

REMARKS

I. Status of Claims

Claims 1-13 are pending and claim 1 is independent. Claims 6 and 7 are amended.

Claims 6-7 stand rejected under 35 USC 112, second paragraph, as indefinite for failing to point out and distinctly claim the subject matter of the invention.

Claims 1-2 stand rejected under 35 USC 102(a) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Kamiyama (JP '779). Claims 1-2 and 12-13 stand rejected under 35 USC 102(a) as anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Nakasaka *et al.* (US Pub. 2002/0104520 A1). Claims 1-5 stand rejected under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Nakamura *et al.* (USP 6,390,041).

Claims 8-11 are objected to as being dependent upon a rejected base claim.

Reconsideration of the rejections is respectfully requested in view of the following remarks.

II. 35 U.S.C. 112, second paragraph, Rejections

Claims 6 and 7 are amended to correct any perceived ambiguity.

III. Pending Claims

Claims 1-2 stand rejected under 35 USC 102(a) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Kamiyama (JP '779). Claims 1-2 and 12-13 stand rejected under 35 USC 102(a) as anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Nakasaka *et al.* (US Pub. 2002/0104520 A1). Claims 1-5 stand rejected under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Nakamura *et al.* (USP 6,390,041).

The Applicant submits that claim 1 is patentable over the cited references because it recites a control device of a multicylinder internal combustion engine having, "...a valve operating characteristic control means for controlling a valve operating characteristic of at least one of an intake valve and an exhaust valve, which estimates an intake difference of cylinders

and limits a control range of the valve operating characteristic in accordance with the estimated intake difference.”

Applicant submits that none of the cited references disclose a control device as recited in claim of the present invention. Moreover, Applicant submits that references 2 and 3, which are described herein below, correspond to Japanese Unexamined Patent Publications (Kokai) No. 2002-303187 and No. 2001-173469, respectively, described in the “Background Art” section of the specification.

Kamiyama’s (JP2002-155779A - reference 1)

Kamiyama’s control device is completely different from the control device described in claim 1 of the present invention. The present invention relates to a control device wherein an intake difference of cylinders is estimated and a control range of the valve operating characteristic is limited in accordance with the estimated intake difference so as to reduce an intake difference of cylinders.

In contrast, Kamiyama discloses a control device of a multicylinder internal combustion engine wherein an intake air amount is detected with respect to every cylinder and an amount of fuel injected into cylinder is adjusted with respect to every cylinder in accordance with the detected intake air amount for every cylinder. Therefore, an actual air-fuel ratio is made coincident with a target air-fuel ratio in all cylinders.

For at least these reasons, claim 1 and its dependent claims are patentable over Kamiyama and the cited references.

Nakasaka et al. (US2002/0104520A1 – reference 2)

Nakasaka *et al.* discloses several types of control apparatuses for a multicylinder internal combustion engine. However, also in contrast to the present invention, it does not disclose a control device wherein an intake difference of cylinders is estimated and a control range of the valve operating characteristic is limited in accordance with the estimated intake difference.

For example, Nakasaka *et al.* discloses a control apparatus for a multicylinder internal combustion engine provided with a controller that calculates an exhaust gas air-fuel ratio of a cylinder when valve opening characteristics of an intake valve and an exhaust valve of each of the cylinders of the internal combustion engine are set such that an amount of an intake air introduced into the cylinder is not limited by the valve opening characteristics. Therefore, the control apparatus of Nakasaka *et al.* reduces variations in fuel injection quantity among the cylinders on the basis of the calculated exhaust gas air-fuel ratio of each of the cylinders. Specifically, in this control apparatus, in order to appropriately correct the respective fuel injection quantity, such as on the basis of the calculated exhaust gas air-fuel ratio of each of the cylinders, the valve opening characteristics of an intake valve and an exhaust valve are set as mentioned above so that each amount of intake air introduced into each of the cylinders is made equivalent.

Therefore, it might be said that in the Nakasaka *et al.* apparatus, the valve opening characteristics of an intake valve and an exhaust valve are limited to a certain valve opening characteristic so as to reduce an intake difference of cylinders. However, in contrast to the present invention, this control is performed only when correcting the respective fuel injection quantity. Also, in the Nakasaka *et al.* apparatus, a control range of the valve operating characteristics is not limited in accordance with the estimated intake difference. Consequently, the effects obtained by the control device described in claim 1 of the present application cannot be obtained by this apparatus.

For at least these reasons, claim 1 and its dependent claims are patentable over Nakasaka *et al.* and the cited references.

Nakamura *et al.* (USP 6,390,041-reference 3)

Nakamura *et al.* discloses a variable valve device comprising an actuation mechanism which is able to change the valve lift wherein a first portion of the valve, changes continuously, lifting between a high lift and a low lift, and a second portion of the valve lifts between the low lift and zero lift is changed with one of the low lift and zero lift selected. That is, in this device, the valve lift control region, where the valve lift is very small, is not used.

In contrast to the control device of the present invention, this device is not a device which estimates an intake difference of cylinders and which limits a control range of the valve operating characteristic in accordance with the estimated intake difference. Specifically, in the device disclosed in Nakamura *et al.*, the above valve lift control region will not be used even if the intake difference of cylinders becomes sufficiently small even though the valve lift is very small. As a result, the effect of control of the valve lift to control the intake (e.g., improvement of the fuel efficiency) may end up being reduced.

On the other hand, in the control device described in claim 1 of the present application, the limit on the control range of a valve operating characteristic is determined in accordance with the estimated intake difference of cylinders. Therefore, it is possible to limit the control range of the valve operating characteristics in accordance with the actually occurring intake difference of cylinders, that is, the extent of the torque fluctuation and exhaust emission due to the same. Thus, no deterioration of the exhaust emission is invited and the effects to the control of the valve operating characteristics to control the intake can be maintained as much as possible. Likewise, torque fluctuation due to the intake difference of cylinders can be suppressed.

For at least these reasons, claim 1 and its dependent claims are patentable over Nakamura *et al.* and the cited references.

For the reasons set forth above, the Applicants submit that the control device recited in claim 1 is not anticipated or rendered obvious by any of the cited references, and therefore claim 1 and its dependent claims are patentable over all of the cited references.

IV. Conclusion

The Examiner is invited to contact the undersigned at (202) 220-4420 to discuss any matter concerning this application.

Applicants do not believe that any additional fees are required in connection with this submission. Nonetheless, Applicants authorize payment of any additional fees under 37 CFR §§ 1.16 or 1.17 or credit any overpayment to Deposit Account No. 11-0600.

Respectfully submitted,

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